**LIGHT AND HR DIAGRAM**

LAB REPORT – 77 pts.

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Group #: \_\_\_\_\_\_\_\_

Period: \_\_\_\_\_\_\_\_

**QUESTION:**

How can you create an example of the colors of visible light on the electromagnetic spectrum?

**HYPOTHESIS (1 pt.)**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**MATERIALS:**

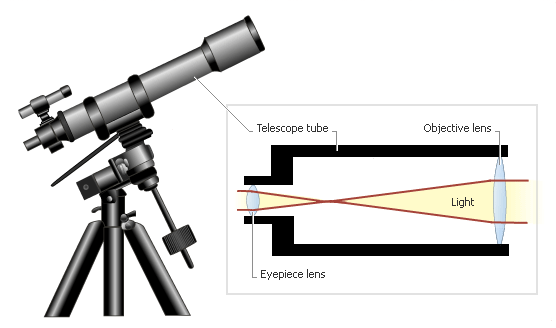
* Graph paper
* Colored pencils
* Metric ruler
* 1 lab report sheet per student

**INTRODUCTION:**

The reason we see everything around us, including celestial bodies in space, is due to the fact the objects we see are either producing or reflecting visible light, which is a part of the **electromagnetic spectrum**. All of the wavelengths of electromagnetic radiation are a part of this spectrum. The two main type of optical telescopes, which gather and collect visible light, are **refracting** (convex lenses) and **reflecting** (mirrors). These are used for studying nearby and distant objects in space. **Nuclear fusion** is a process occurring in the Sun where the nuclei of small atoms combine to form more-massive nuclei. An **HR-Diagram** shows the luminosity (brightness) and the surface temperature for known stars.

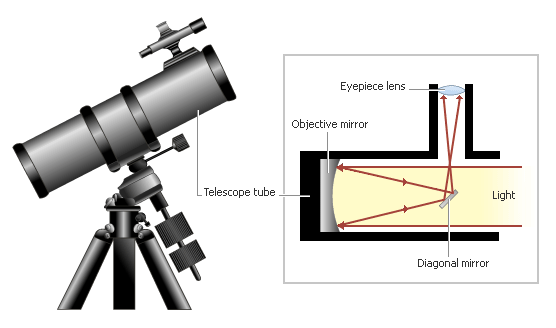
**PROCEDURE:**

1. Draw the electromagnetic spectrum in color, where necessary, in the box provided below making sure to include the following features: **(18 pts.)**
   * The 7 types of electromagnetic radiation
   * The colors of visible light in order
   * Waves (label long/short)
   * Frequency (label high/low)
2. Look at the diagrams below. Each represents a different type of optical telescope. Fill in the blank space on the diagrams appropriately using your notes and prior knowledge. **(11 pts.)**



\_\_\_\_\_ Telescope

\_\_\_\_\_ Telescope



1. Retrieve your piece of graph paper and put your name and period number on the back of it in case it gets misplaced from this lab report.
2. Label your piece of graph paper so it resembles the image below. You will make a 7 x 6 box grid with each box consisting of 100 (10x10) individual square grids on the piece of graph paper in order to take up most of the sheet of graph paper. The top portion of your x-axis should be labeled “Spectral Type”, just like the image below. The bottom portion of your x-axis should be labeled with the spectral classes: O B A F G K and M. Above each spectral class letter, label each individual square grid 0 through 9. Below each spectral class letter, write the average temperature (in Kelvin) for that class using the following information, representing increasing temperature from left to right:
3. 41,000 K

B 31,000 K

A 9500 K

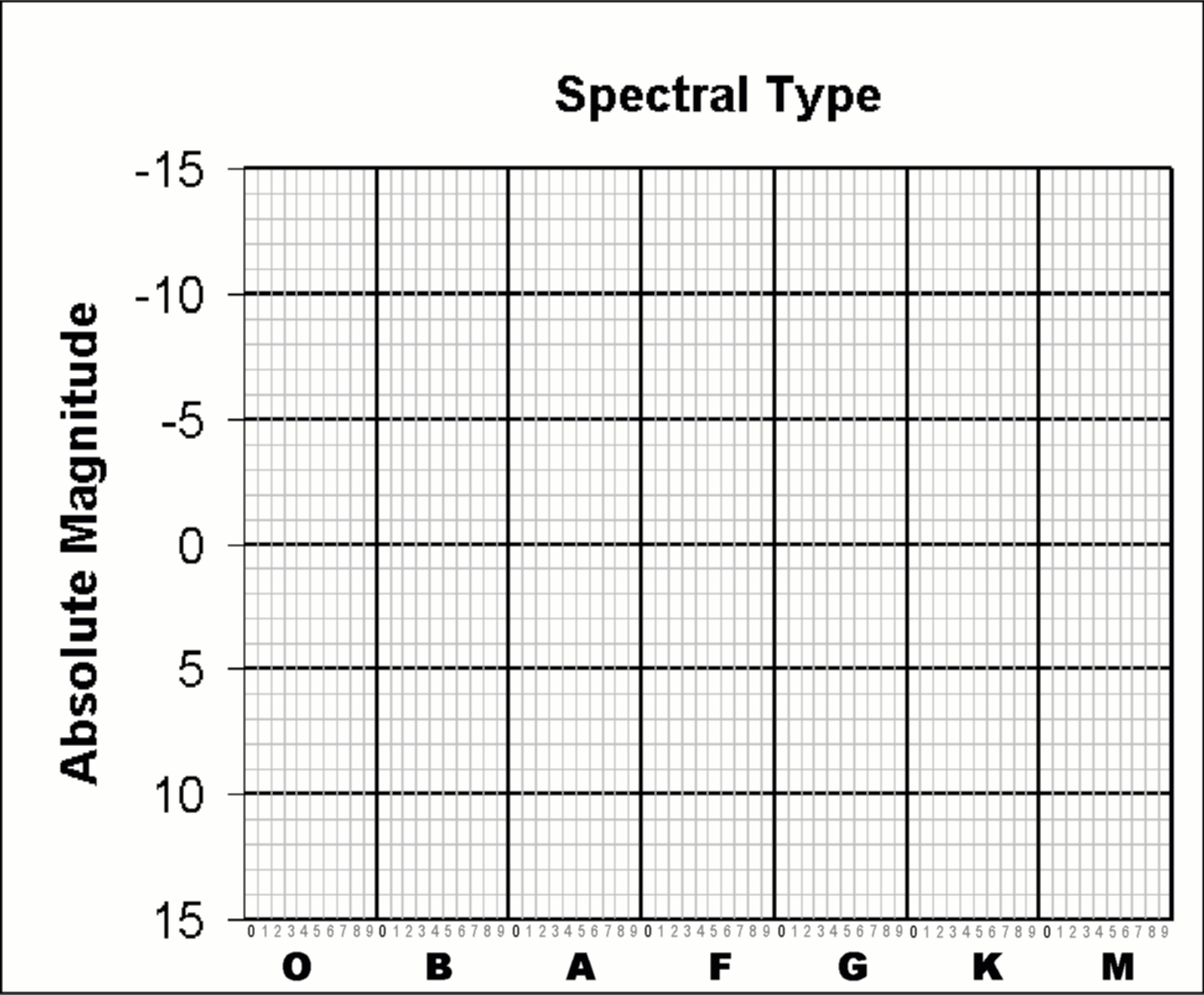
F 7240 K

G 5920 K

K 5300 K

M 3850 K

The y-axis should be labeled “Absolute Magnitude” and beginning at the bottom of the y-axis, label each vertical box separation 15 through -15 in increments of 5, representing increasing brightness from bottom to top. **(6 pts.)**



1. Using the star data table below, plot and label each star on your graph paper, representing your own created version of the HR Diagram. As you plot each star, do so using a small open circle in order to shade in your star the appropriate color after you have plotted them all.

|  |  |  |
| --- | --- | --- |
| **Common Name** | **Absolute Magnitude** | **Spectral Type** |
| Sun | 4.8 | G2*V* |
| Sirius A | 1.4 | A1*V* |
| Sirius B | 11.5 | B8*VII* |
| Canopus | -3.1 | F0*II* |
| Arcturus | -0.3 | K2*III* |
| Vega | 0.5 | A0*V* |
| Achernar | -5.2 | M2*I* |
| Rigel A | -6.8 | B8*I* |
| Rigel B | -0.4 | B9*I* |
| Procyon A | 2.7 | F5*V* |
| Procyon B | 13.0 | F0*V* |
| Proxima Centauri | 15.5 | M6*V* |
| Betelgeuse | -5.5 | M2*I* |
| Aldebaran A | -0.2 | K5*III* |
| Aldebaran B | 12.0 | M2*III* |
| Spica | -3.6 | B1*V* |
| Pollux | 0.1 | K0*III* |
| Deneb | -6.9 | A2*I* |
| Regulus | -0.7 | B7*V* |
| Bellatrix | -4.2 | B2*III* |

1. Shade in the each according to its color, represented by its spectral class, using the following information as a guideline: **(20 pts.)**

O Blue

B Blue

A Blue-White

F White

G Yellow-White

K Orange

M Red

1. Label the following groups on your HR Diagram: supergiants, giants, main-sequence, and white dwarfs based on their luminosity roman numeral. **(4 pts.)**

**LAB QUESTIONS (1 pt. each) –** *Please write your answers in* ***COMPLETE SENTENCES****!*

1. Name the seven wavelengths of the electromagnetic spectrum.

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1. Describe the three different types of spectra.

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1. Describe the process of nuclear fusion in our Sun.

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1. What is Einstein’s energy-mass equation and what do the variables stand for?

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1. Differentiate between apparent magnitude and absolute magnitude.

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1. Name the characteristics of a star we can get by viewing an HR Diagram.

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1. What is the exact apparent magnitude and exact absolute magnitude of our sun?

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1. What type of telescope is the Hubble Space Telescope and what is this object used for?

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1. According to your HR Diagram that you created, which star has a greater temperature, the Sun or Betelgeuse?

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1. According to your HR Diagram that you created, which star is brighter, Procyon or Pollux?

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1. Name a supergiant star that you plotted on your HR Diagram and explain how you know it is a supergiant star.

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1. Name a white dwarf star that you plotted on your HR Diagram and explain how you know it is a white dwarf star.

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**CONCLUSION (5 pts.) –** *Write a solid paragraph (at least 5 sentences) about your conclusions from the lab. Discuss the steps you went through during your lab experiment, what you accomplished, and how you tested your hypothesis. Also include what you learned as a result of this lab experiment.*

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